

01FN046US

AMENDMENT WITH RCE

02230028aa

Amendment dated 06/09/2004

Reply to office action mailed 03/11/2004

REMARKS

Claims 1-3 and 5-9 are currently pending in the application. By this amendment, claims 1 and 6 are amended for the Examiner's consideration. The foregoing separate sheets marked as "Listing of Claims" shows all the claims in the application, with an indication of the current status of each.

The Examiner has rejected claims 6-9 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. The Examiner's comments suggest that the layer as specified in the language of the prior amendment is not clearly distinguished from the magnetic layer already provided. The present amendment overcomes this confusion. It will be observed that the underlying layer of claim 1 (between the free layer and the lower conductive layer) is denominated a magnetic layer in claim 6.

The Examiner has rejected claims 1-3 and 5 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,469,879 to Redon et al. ("Redon"). In light of the arguments made in the prior response of the applicants, the Examiner notes that

"... all the claims require is an underlying layer, which no other structural or functional or compositional attributes associated with it. Thus, the Examiner has interpreted the underlying layer in a broad, yet reasonable manner, that is completely consistent with the plain and ordinary meaning of the term 'underlying.' ... the Applicants do not point to an express definition within their specification that would preclude this broad, yet reasonable interpretation."

However, the Examiner has given an interpretation to the elements of Fig. 3 in Redon that is inconsistent with the text of the Redon disclosure. It will be observed that item 20 is shown as a "ferromagnetic free layer" (col. 7, line 7). There is no showing of an "underlying layer" below this free layer. As one preferred example of the invention, Redon further describes free layer 20 as being

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"in the form of a synthetic ferrimagnet (sic) of a three-layered laminate body of NiFe layer 21 .../Ru layer 22 .../NiFe layer 23 ... as illustrated in Fig. 3. In this example, magnetization directions 21a and 23a of the NiFe layers 21 and 23 are opposite to each other." (col. 7, line 65, to col. 8, line 3)

Thus it is clear that layers 21, 22 and 23 are not separate layers at all but rather an integral implementation of layer 20. In particular, layer 23 cannot be interpreted by itself as the free layer 20, anymore than layer 21 by itself could be interpreted as the free layer 20. Standard and well understood arguments of symmetry prevent any distinction between layers 21 and 23 in this regard. Instead, layers 21 and 23, separated by layer 22, operate together as layer 20. The correct interpretation of layers 21 and 22 is not that they underlie layer 23, but rather that they are a part of free layer 20. Consequently, while a surface interpretation of the mere drawing elements of Fig. 3 would seem to support the Examiner, the actual text of Redon shows that this interpretation is untenable.

In further discussions with the Examiner on May 14, 2004, following issuance of an Advisory Action indicating that the proposed amendment would not be entered because it raised new issues and would require further search, the Examiner explained that his use of the diagram in Redon (Fig. 3) was not dependent upon the text of Redon. Instead, the Examiner cited additional references to support his interpretation of the layers (21,22,23) shown in Fig. 3 for item 20. In particular, the Examiner cited U.S. Patent No. 5,408,377 to Gurney and US Patent Application Publication US2003/0197505 to Sakakima et al. ("Sakakima"). Gurney describes, in connection with Fig. 6, a "free ferromagnetic layer 70" comprised of first and second "free ferromagnetic film" (71,73) (col 5, lines 46-54). The two free ferromagnetic films 71, 73 in the free layer 70 have opposite magnetization directions. This structure appears very similar to the free layer 20 shown in Redon Fig. 3. However, Gurney uses the term "free" to describe the films 71, 73 whereas Redon does not use such a term to describe the comparable NiFe layers 21, 23.

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Thus Gurney is suggestive, in combination with Redon, for the Examiner's interpretation that each of the NiFe layers (21, 23) in Redon is a "free layer". The Examiner further cites Sakakima (para 239), where a similar structure is shown in Fig. 10. In Sakakima, the free layer 5 is composed of "two synthetic antiferromagnetic free layers." While the sub-structure is not shown, the term "free layer" is used explicitly.

However, the very references used by the Examiner indicate the functionality of the larger structure, i.e. free layer 20 in Redon. The two oppositely magnetized layers are "strongly coupled antiparallel across a metallic ... coupling film" (Gurney; col 7, lines 27-29) and "respond to the signal field as a rigid unit" (Gurney; col 7, lines 35-37). The larger structure is a "ferromagnetic sensing layer" (i.e. laminated free layer 70 of Gurney; col 7, lines 25-26). Similarly, Sakakima describes coupling of the "two synthetic antiferromagnetic free layers" so as to "virtually [decrease] the thickness of the free layer 5 [thereby enhancing] the sensitivity of a head which includes such an element." Thus it is clear that the functionality of the larger free layer 20 structure shown in Redon is to serve as a sensing layer, and that this sensing functionality is enhanced by the coupling of the two oppositely magnetized layers.

Consequently, even if the references cited by the Examiner provide support for the Examiner's interpretation of layer 23 of Redon as a "free layer", this interpretation cannot be maintained if the functionality of the "free layer" is added to the claim, since the sensing functionality is dependent upon the antiparallel coupling of the two oppositely magnetized layers (21, 23). The antiparallel coupling is clearly shown by the two arrows (21a, 23a) in Fig. 3 of Redon. As described in Gurney, these two coupled layers respond "as a rigid unit" to the signal field, allowing the larger structure to perform its sensing function. There is no support for a sensing functionality, for the "head which includes such an element," residing separately in either of the oppositely magnetized layers (21, 23).

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The claims have been amended to add as a further limitation of the “free layer” the functionality of a sensing layer for the head, as described in the specification at page 30, lines 9-19 (clean specification). Claim 1 has been amended explicitly, and it will be observed that the sensing functionality is already contained in claim 6. Therefore, it is submitted that the claims as thus modified provide for a free layer functionality that requires the larger structure described as layer 20 in Redon, and thereby excludes the component layer 23 in Redon. It follows that Redon does not disclose an underlying layer for this larger structure free layer.

The present invention overcomes the inability of prior art structures to provide a magneto-resistence effect element that achieves three objectives together: 1) prevent the sense current from flowing into the vertical bias layer; 2) provide a read signal having a low noise level; and 3) where the read signal has a good signal to noise (S/N) ratio and bit error rate. Redon seeks to provide a magneto-resistive tunnel junction wherein the current flows mainly in the center rather than mainly branching to the end portions, so as to achieve a high head output and provide flexibility in selection of biasing means. Both inventions provide a free layer extending over the vertical bias area, on top of which is a non-magnetic layer, and then a pinned and a pinning layer. However, there is no indication in Redon of an underlying layer. The Examiner suggests that items 21 and 22 in Figure 3 are underlying layers for the free layer, but this is untenable, as described above.

In view of the foregoing, it is requested that the application be reconsidered, that claims 1-3 and 5-9 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at 703-787-9400 (fax: 703-787-7557; email: clyde@wcc-ip.com) to discuss any other changes deemed necessary in a telephonic or personal interview.

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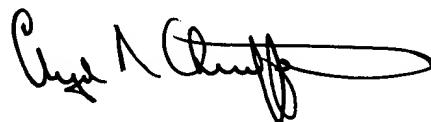
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If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,



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